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REMARKSClaims

Claims 1-21 and 30-43 remain pending.

Claims 1 and 30 have each been amended to recite a signal indicative of a pressure of a gas to which the pressure sensor is exposed.

Response to Office Action

The Office Action expressed the view that claims 1-21 and 30-43 were obvious in light of US Patent No. 6,127,765 (Fushinobu). The Applicant submits that Fushinobu fails to teach or suggest the claimed apparatus whether taken on its own or in combination with the other cited references.

Claims 1 and 30

These claims, as amended, recite that the means for monitoring a temperature (claim 1) and the temperature sensor (claim 30) control a signal indicative of a pressure of a gas to which the pressure sensor is exposed. None of the prior art teaches or suggests such a feature. Fushinobu does not contemplate pressure measurement by the mechanism of this invention.

Even if one were motivated to modify Fushinobu to include a temperature sensor to prevent overheating, as suggested by the Office Action, such a pressure sensor would not be able to provide the signal as claimed since application of heat to Fushinobu's cantilever (22) causes cantilever (22) to separate from the substrate (col. 3, ln. 29-30). Separation occurs in only 25 nanoseconds (25×10^{-9} seconds) (col. 3, ln. 45).

Therefore, the Applicant submits that claim 1, claims 2-20 which depend from claim 1, claim 30, and claims 31-40 which depend from claim 30, are all in condition for allowance.

Claims 2, 21, 31 and 41-43

Claims 2, 21, 31, and 41 recite a surface roughness in the range of nanometers to tens of nanometers.

The Office Action suggests that it is common to have some degree of roughness due to etching techniques and hence the exact degree of roughness is a matter of experimental

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choice. The Applicant submits that this would be the case only if it were already known to provide a pressure sensor according to the invention. Even if surface roughness experiments were conducted in the context of the Fushinobu device, they would be evaluated with reference to the purpose of the Fushinobu device which is to prevent stiction. There is no teaching in any of the cited references that such purposes would lead one without difficulty to a roughness in the claimed range or that experiments of the nature that would lead one to the claimed range should be conducted. As previously pointed out, surfaces having a roughness in the claimed range of nanometers to tens of nanometers are particularly advantageous in the context of this invention.

Therefore, the applicant submits that claims 2, 21, 31, 41, and claims 42-43 which depend from claim 41, are in condition for allowance.

Claims 3, 4-7 and 32

Claims 3 and 32 recite a "an electrically conductive pathway passing through the member". The member is heated by an electrical current passing through the electrically conductive pathway. Fushinobu fails to disclose this feature.

Every one of Fushinobu's embodiments illustrates a heating resistor (22, 32 or 46) in the substrate. Fushinobu mentions that "the stiction recovery means or heating elements may be provided for the movable parts themselves," but only when "the micro-mechanical device comprises a plurality of movable parts and there is a tendency that stiction occurs between the movable parts" (col. 4, ln. 50-54).

Claim 4 recites "the means for monitoring a temperature of the member comprises the electrically conductive pathway". Since Fushinobu teaches putting resistors (22, 32 or 46) in the substrate, such resistors cannot serve to measure a temperature of the member since, even if the member comes into contact with the substrate, Fushinobu teaches that the member is released in nanoseconds when current is passed through resistors (22, 32 or 46).

Therefore, the Applicant submits that claim 3, claims 4-7, which depend from claim 3, and claim 32 are allowable.

Claims 11 and 35

Claims 11 and 35 recite that the member "comprises a generally linear elongated bridge supported above the substrate at either end, the bridge having a central portion collapsed onto and adhering by stiction to a surface of the substrate". The Office Action suggests that

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US Patent No. 5,589,810 (Fung) discloses this feature and that it would be obvious to combine Fung and Fushinobu.

The Applicant submits that both of these propositions are incorrect. Fung does not disclose a generally linear elongated bridge as claimed. Fung discloses a pressure sensor having a diaphragm which is roughly square as shown in Figure 1A. Further, Fung's diaphragm is not collapsed onto a surface of a substrate. Fung's diaphragm contacts substrate (12) only around its edges. Fung's diaphragm is not adherent by stiction to a substrate. If it were, Fung's diaphragm could not move, as required. Moreover, there is no motivation to combine Fung and Fushinobu since the Fung sensor does not have any parts which are likely to become adherent by stiction to any other parts.

Therefore, claims 11 and 35 are submitted to be allowable.

Claims 13-15 and 37

These claims all include first and second pressure sensors according to the invention arranged with first and second resistors in a Wheatstone bridge configuration.

The Office Action alleges that it would be obvious to arrange Fushinobu's devices in a Wheatstone bridge configuration, because Smith shows pressure sensors arranged in a Wheatstone bridge configuration. This analysis is flawed because it impermissibly uses the hindsight information that a structure according to this invention can function as a pressure sensor.

There is no motivation for a person skilled in the art to attempt to connect a plurality of members as shown in any of Fushinobu's Figures 1-5 together in a Wheatstone bridge configuration. Further, it is not clear what would be connected in such a configuration. The only electrical components shown in the embodiments of Fushinobu referred to in the Office Action are the resistors (23, 32 and 46) used to heat Fushinobu's movable part to prevent stiction. There is no reason why anyone would consider connecting these resistors in a Wheatstone bridge configuration.

Fushinobu discloses a diaphragm-type pressure sensor in Figures 6 and 7. If one were motivated to connect such pressure sensors together in a Wheatstone bridge configuration, it is strain gauges (44) that would be included in the Wheatstone bridge circuit.

Therefore, the applicant submits that claims 13-15 and 37 are allowable.

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Claims 17, 18 and 39 recite that the substrate is patterned with a pattern of plateaus and valleys in its portion under the member, the member is adherent by stiction to the plateaus, and the member is not in contact with the valleys.

The Office Action alleges that Fung discloses a pattern of plateaus (305) and valleys. Since Fung does not disclose such plateaus and does not use the reference numeral (305), the Applicant assumes that the Office Action meant to cite US Patent No. 6,156,585 (Gogoi et al.) for posts (305). Gogoi et al. disclose two diaphragms (106) and (303). Posts (305) extend between the diaphragms to prevent localized deflections of the diaphragms. The Gogoi et al. diaphragms are not adherent by stiction to posts (305), but are formed integrally with posts (305).

Claim 18 recites that the "plateaus and valleys differ in elevation by a distance in the range of 3 nanometers to 20 nanometers." Gogoi et al. fails to disclose this feature. Gogoi's posts (305) must pass through fixed electrode (203). If the plateaus and valleys differed in elevation by only 3 to 20 nanometers, there would be no room for electrode (203).

Further, there is no motivation to modify the Gogoi et al. apparatus to provide a heater and a temperature sensor, as claimed. The Office action suggests that a motivation is "improving the accuracy of capacitance", but this makes no sense. There is also no motivation to modify the Gogoi et al. apparatus to provide a member adherent by stiction to plateaus on a substrate. Both of the diaphragms disclosed by Gogoi et al. must move relative to a substrate to function. Making either diaphragm adhere by stiction to a substrate would not be obvious to do, because it would destroy the function of the Gogoi et al. device.

There is also no motivation to include posts (305) as shown by Gogoi et al. under the movable part of the Fushinobu device. Such posts would interfere with the movement of the movable part.

Therefore, the Applicant submits that claims 17, 18 and 39 distinguish the cited references and are allowable.

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Conclusion

In light of the foregoing amendments and remarks, it is submitted that claims 1-21 and 30-43 are in condition for allowance, which is respectfully requested. The Examiner is invited to contact Gavin N. Manning by telephone at (604) 669-3432 to discuss any outstanding issues.

Respectfully submitted,

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